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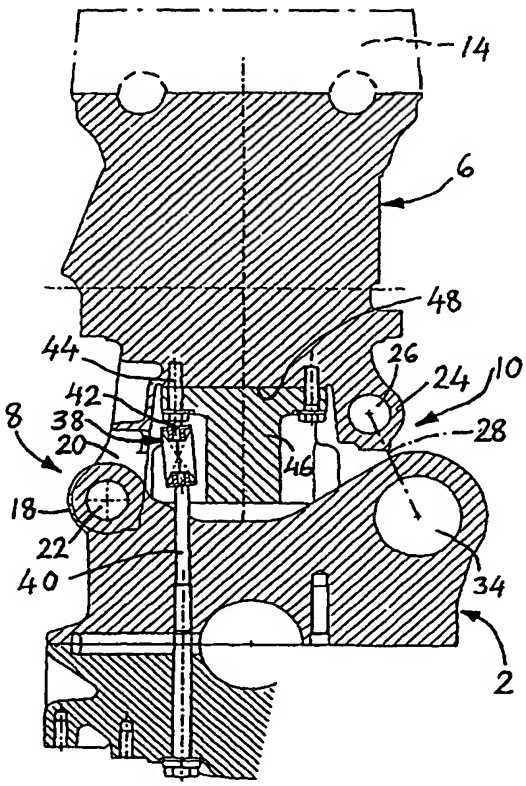
(54) Title: ARRANGEMENT FOR PREVENTING BEARING-RELATED NOISE IN INTERNAL COMBUSTION ENGINES

(57) Abstract

Internal combustion engine with variable compression, comprising a crankshaft-bearing crankcase part (2) and a cylinder-receiving part (6) arranged tiltably thereon by means of a tilt axle bearing (8) on one side of the engine and a tilt mechanism (10) on the other, opposite side of the engine, which cylinder-receiving part (6) supports a cylinder head (14) which is securely connected thereto, preferably with camshafts mounted therein. Arranged between the crankcase part (2) and the cylinder-receiving part (6) there are prestressing members (38) which force these engine parts apart and work to counteract the occurrence of bearing play in the tilt axle bearing (8) and in the tilt mechanism (10) when compression-modifying tilting movement between the cylinder-receiving part (6) and the crankcase part (2) occurs during running of the engine.



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Arrangement for preventing bearing-related noise in internal combustion engines

The present invention relates to an internal combustion engine of the type specified in the pre-characterizing clause of Patent Claim 1.

In this type of internal combustion engine, the compression can be varied by means of the fact that the engine's cylinder-receiving part (with associated cylinder head) can be tilted (inclined) to the side in relation to the crankcase part. To permit this, the cylinder-receiving part is mounted tiltably on the crankcase part on one side of the engine, and is connected movably to the crankcase part on the other, opposite side of the engine, by way of a tilt mechanism located there.

Prior art

Internal combustion engines of the abovementioned type are already known, and in this connection reference may be made, for example, to US-2,770,224 and SE-B-470 238.

The first of these patent specifications describes a piston engine with a fixed crankcase part, to which a cylinder-receiving engine part with associated cylinder cover is connected in an articulated manner. The combustion chamber volumes of the cylinders can be varied by tilting the cylinder-receiving engine part sideways about a longitudinal tilt axle. This tilting movement, i.e. change in the lateral inclination, is obtained by turning of an eccentric axle included in a tilt mechanism acting between the crankcase part and the cylinder-receiving engine part.

When the cylinder-receiving part (cylinder block) of an internal combustion engine, for example an in-line

engine, of the abovementioned type is inclined (tilted) relative to the crankcase part, the distance between the crankshaft mounted in the crankcase part (with associated pistons linked to connecting rods) and the cylinders in the cylinder-receiving part changes. The volume of that part of the combustion chamber which lies above the respective piston's upper boundary surface (piston top) at the upper dead centre of the piston is thereby changed. The compression ratio of the engine can thus be varied in this way, and efficiency is thereby optimized for varying loading conditions. The performance of the engine and thus also of the vehicle in question is thereby improved.

Object of the invention

As a result of the above structural configuration of an internal combustion engine, and its principle of changing (varying) the compression in the cylinders by means of lateral tilting of the cylinder-receiving part in relation to the crankcase part of the engine, a certain amount of clearance or play arises both in the tilt axle bearing and in the various bearings of the tilt mechanism when the tilting movement in question takes place.

Since the tilt axle bearing on one side of the engine comprises a number of bearing lugs in the crankcase part, and a number of bearing lugs on the cylinder-receiving part which project into the spaces between these bearing lugs, and also a bearing axle passing through and connecting all these bearing lugs, it is necessary, for assembly technology reasons, to accept greater manufacturing tolerances, and thus greater bearing play, than it would be possible to achieve purely from the viewpoint of manufacturing technology.

This fact, together with the consideration that lubricant-free bearings ought in practice to be chosen

- on account of small relative movements between interacting bearing components/bearing surfaces and the lack of sufficiently frequent changing of direction of force - means that the bearing play is quite great, thereby causing unwanted noise, especially at high loads.

The primary object of the present invention is to design an engine operating with variable compression in such a way that the occurrence of the abovementioned bearing-related noise can be prevented or at least to a large extent obviated.

Description of the invention

According to the present invention, the above object is achieved by the fact that the engine has the features set out in the characterizing clause of Patent Claim 1.

Thus, the primary distinguishing feature of the internal combustion engine is that, arranged between the crankcase part and the cylinder-receiving part there are prestressing members which force these engine parts apart and work to counteract the occurrence of bearing play in the tilt axle bearing and in the tilt mechanism when compression-modifying tilting movement between the cylinder-receiving part and the crankcase part occurs during running of the engine.

Developments and preferred embodiments of the subject of the invention may also have the features set out in Claims 2 - 11.

Because the cylinder-receiving part with its associated cylinder head and the crankcase part are kept stressed apart in the manner indicated above, when the gas forces in the cylinders occur, the effect of the bearing play can be at least largely eliminated and the resulting noise in the engine can be prevented.

The internal combustion engine can, for example, be a four-cylinder, five-cylinder or six-cylinder in-line engine with overlying camshafts mounted in the cylinder head securely connected to the cylinder-receiving part. It is possible (but not essential) for the cylinder head and the cylinder-receiving part to be fully integrated and constitute parts of one and the same monobloc piece (monobloc engine).

On one side of the engine, the cylinder-receiving part has bearing lugs for the hinge axle of the tilt bearing, and on the opposite side of the engine bearing lugs for the upper hinge axle of the tilt mechanism. The last-mentioned bearing lugs preferably constitute integral parts of the cylinder-receiving part. Arranged between the crankcase part and the upper hinge axle of the tilt mechanism there are link members which transmit the tilting movement and which serve to change the distance between the said upper hinge axle and an eccentric shaft which is mounted in the bearing lugs of the crankcase part and which constitutes the lower hinge axle of the tilt mechanism.

In a first main embodiment according to the invention, the prestressing members are arranged inside the bearing lugs of the tilt axle bearing and are intended, with their opposite ends, to press directly or indirectly in one direction against a tilt axle passing through the bearing lugs and mounted in the crankcase part, and, in the other direction, to press against a collar part fixed in relation to the cylinder-receiving part.

In this embodiment, it is also preferable for the tilt mechanism members to comprise rods like connecting rods coupled between, on the one hand, a first axle which runs through the bearing lugs connected securely to the cylinder-receiving part and, on the other hand, a

second axle mounted eccentrically in the crankcase part, prestressing members being arranged in the rods and being intended, with their opposite ends, to press directly or indirectly against the first axle and the second axle, respectively, in order to generate a force stressing these two axles apart.

On that side of the second axle remote from the rod (link member) transmitting the tilting movement, prestressing members are also preferably arranged in the crankcase part which act between the crankcase part and the associated side of the second axle and are intended to exert pressure on the axle.

The prestressing members in both the bearing lugs of the tilt axle bearing and in the rods (link members) and the crankcase part can preferably comprise cylindrical spring stacks consisting of cup springs.

In a second, alternative embodiment according to the invention, in the area between the tilt axle bearing and the tilt mechanism, and inserted between the crankcase part and the cylinder-receiving part, there are prestressing members which tension these two parts apart and act between, on the one hand, a collar part rigidly connected to the crankcase part and, on the other hand, a collar part rigidly connected to the cylinder-receiving part.

The collar part rigidly connected to the cylinder-receiving part can then be a tightening screw provided with a specially designed head and serving to fix a cylinder lining support on the underside of the cylinder-receiving part.

The collar part rigidly connected to the crankcase part can for its part, for example, consist of one end of a prestressing bar screwed into the crankcase part.

In the last-mentioned embodiment, the prestressing members can expediently be powerful cylindrical screw

springs tensioned between the opposing collar parts in question.

In general terms, however, as regards the prestressing members according to the invention, these can either be suitable compression springs or spring stacks, or other types of force generators, for example hydraulic force generators.

When the engine is an in-line engine and the prestressing members are arranged as in the abovementioned second main embodiment, it is preferable, for reasons of force symmetry, for the prestressing members to be placed in an axial row and distributed uniformly along the cylinder line, preferably in the areas between adjacent cylinders in the cylinder line.

Brief description of the figures

The invention will now be explained and clarified with reference to a number of illustrative embodiments which are shown in the attached drawings.

In the drawings:

Figure 1 shows a diagrammatic and perspective view of the main parts of the tilt mechanism in an internal combustion engine of the same basic type as the internal combustion engine according to the present invention;

Figure 2 shows a partial diagrammatic side view of the tilt axle bearing in an embodiment of an internal combustion engine according to the invention;

Figure 3 shows a diagrammatic cross section through the engine in Figure 2; and

Figure 4 shows a diagrammatic cross section through an alternative embodiment of an internal combustion engine according to the invention.

Description of illustrative embodiments

The primary parts of an internal combustion engine of the type to which the present invention relates are shown in Figure 1. The internal combustion engine, in this case a four-cylinder in-line engine, is constructed in such a way that its compression can be varied while running. The engine comprises a crankcase part 2, in which the crankshaft 4 (not shown here, but shown in Figure 4) is mounted, and a cylinder-receiving part 6 which is connected tiltably to the crankcase part so that it can be inclined/tilted sideways in relation to the crankcase part. To permit this lateral tiltability of the cylinder-receiving part 6, a tilt axle bearing 8 is provided between the parts 2 and 6 on the furthest away long side (not shown here) of the engine, and on the long side of the engine visible here there is a tilt mechanism, generally designated by 10, between the crankcase part 2 and the cylinder-receiving part 6. The part 6 in this case contains four cylinders designated 12, and a cylinder head 14 or cylinder cover (not shown here, but indicated diagrammatically in Figure 3) is in a conventional manner intended to be sealingly secured on the flat top 16 of the part 6.

The tilt axle bearing 8 not visible in Figure 1 comprises, in the same way as in the embodiment shown in Figure 2, a number of bearing lugs 18 connected rigidly to the crankcase part 2 and a number of bearing lugs 20 which project upwards between these bearing lugs on the cylinder-receiving part 6. Passing through these bearing lugs 18, 20 there is a hinge axle 22 which thus couples the engine parts 2 and 6 in a hinged/tiltable manner. The number of bearing lugs of the parts 2 and 6 is of course dependent on the number of cylinders in the engine; note that the engine in Figure 1 has four cylinders, while the engine in Figure 2 has five cylinders.

The tilt mechanism 10 shown in Figure 1 comprises five

bearing lugs 24 which are rigidly connected to the cylinder-receiving part 6 and form bearing brackets for an upper hinge axle 26 which runs through them and on which rods/links or connection members 28 are pivotably mounted, the lower ends of these being pivotably mounted on "crank-like" axle sections 30 of an eccentric axle 32 with larger bearing sections 34 rotatably mounted in bearing brackets of bearing lugs 36 of the crankcase part 2. A rotation of the eccentric axle 32 generates a change in the distance between the upper hinge axle 26 and the axle sections 30, and thus via the connection members 28 a sideways tilting/inclination of the cylinder-receiving part 6 in relation to the crankcase part 2. The desired compression change in the cylinders is obtained in this way.

Reference is now made to the embodiment of the internal combustion engine according to the invention as shown in Figures 2 and 3. In order to prevent occurrence of noise related to bearing play during running of the engine, both in the tilt axle bearing 8 and in the tilt mechanism 10, prestressing members 38 are arranged between the crankcase part 2 and the cylinder-receiving part 6, which prestressing members 38 are in the form of powerful compression springs which by means of their inherent predetermined tensioning seek continually to press the engine parts 2 and 6 apart so that existing bearing play in the tilt axle bearing 8 and in the tilt mechanism 10 is eliminated in the direction generated by the action of the combustion gases in the cylinders. The pressure of the combustion gases in the combustion chambers in the cylinders seeks to throw the cylinder-receiving part 6 with associated cylinder head upwards, away from the crankcase part 2.

Each of the prestressing members 38 designed as compression springs is inserted between, on the one hand, the end of an associated prestressing bar 40

screwed into the crankcase part 2 and, on the other hand, a collar part 42 rigidly connected to the cylinder-receiving part 6. In this case, the collar parts 42 consist of the cup-shaped heads of fastening screws 44 which are still present at the appropriate sites and which are used for fastening a cylinder lining support 46 on the underside 48 of the cylinder-receiving part 6.

Reference is finally made to the alternative embodiment of the internal combustion engine according to the invention as shown in Figure 4. The prestressing members between the crankcase part 2 and the cylinder-receiving part 6 are in this case positioned and designed differently from the design according to Figures 2 and 3.

Prestressing members 50, here in the form of cylindrical cup springs, are in this case inserted in bores 52 inside bearing lugs 20 belonging to the cylinder-receiving part 6 of the tilt axle bearing 8, where the prestressed members 50 exert pressure at the lower end against the hinge axle 22 and at the upper end against a collar part fixed in relation to the cylinder-receiving part 6. Force transmission between the members 50 and the hinge axle 22 takes place via pressure blocks 54 with cylindrically concave sliding contact surface against the axle 22. At the upper end of each prestressing member 50, the force transmission to the engine part 6 takes place via a pressure rod 56 inserted into the bore 52, which bar thus constitutes the collar part.

On the side of the engine with the tilt mechanism, there are two prestressing members 50 in and on each link-like connection member 28. Inside each connection member 28, there is a prestressing member 50 whose ends exert pressure on the upper hinge axle 26 and on the axle section 30 via pressure blocks 58 and 60,

respectively, with cylindrically concave sliding contact surfaces. Also arranged on the side of the eccentric shaft 32 remote from the connection members 28, there are prestressing members 50 which each act between a part 62 rigidly connected to the crankcase part 2 and, on the other hand, the bearing section 34 of the eccentric shaft 32. The contact with the bearing section 34 is via a pressure block 64 with cylindrically concave sliding contact surface.

Patent Claims

1. Internal combustion engine with variable compression, comprising a crankshaft-bearing crankcase part (2) and a cylinder-receiving part (6) arranged tiltably thereon by means of a tilt axle bearing (8) on one side of the engine and a tilt mechanism (10) on the other, opposite side of the engine, which cylinder-receiving part (6) supports a cylinder head (14) which is securely connected thereto, preferably with camshafts mounted therein, characterized in that arranged between the crankcase part (2) and the cylinder-receiving part (6) there are prestressing members (38; 50) which force these engine parts apart and work to counteract the occurrence of bearing play in the tilt axle bearing (8) and in the tilt mechanism (10) when compression-modifying tilting movement between the cylinder-receiving part (6) and the crankcase part (2) occurs during running of the engine.

2. Internal combustion engine according to Claim 1, characterized in that the cylinder head (14) and the cylinder-receiving part (6) constitute integral parts of one and the same monobloc component.

3. Internal combustion engine according to Claim 1 or 2, characterized in that the tilt axle bearing (8) comprises bearing lugs (20) which are rigidly connected to the cylinder-receiving part (6).

4. Internal combustion engine according to any of Claims 1 - 3, characterized in that the tilt mechanism (10) comprises bearing lugs (24) which are rigidly connected to the cylinder-receiving part (6).

5. Internal combustion engine according to Claim 4, characterized in that the tilt mechanism (10) moreover comprises adjustable tilt mechanism members (28) which

are coupled between the crankcase part (2) and the mechanism's bearing lugs (24), connected to the cylinder-receiving part (6), and which serve to change the distance between these bearing lugs and the crankcase part for the purpose of changing the compression ratio in the engine cylinders (12).

6. Internal combustion engine according to Claim 4 or 5, characterized in that the bearing lugs (24) of the tilt mechanism (10) which are connected to the cylinder-receiving part (6) constitute integral parts of the cylinder-receiving part.

7. Internal combustion engine according to any of Claims 3 - 6, characterized in that prestressing members (50) are arranged inside the bearing lugs (20) of the tilt axle bearing (8) and are intended, with their opposite ends, to press directly or indirectly in one direction against a tilt axle (22) passing through the bearing lugs (20) and mounted in the crankcase part (2, 18), and, in the other direction, to press against a collar part (56) fixed in relation to the cylinder-receiving part (6).

8. Internal combustion engine according to any of Claims 5 - 7, characterized in that the tilt mechanism members (10) comprise rods (28) like connecting rods coupled between, on the one hand, a first axle (26) which runs through the bearing lugs (24) connected rigidly to the cylinder-receiving part (6) and, on the other hand, a second axle (30) mounted eccentrically in the crankcase part, prestressing members (50) being arranged in the rods (28) and being intended, with their opposite ends, to press directly or indirectly against the first axle (26) and the second axle (30), respectively, in order to generate a force stressing these two axles apart.

9. Internal combustion engine according to Claim 8, characterized in that, on that side of the second axle

(30) remote from the rod (28), prestressing members (50) are arranged in the crankcase part (2) which act between the crankcase part and the associated side of the second axle and are intended to exert pressure on the axle.

10. Internal combustion engine according to any of Claims 1 - 6, characterized in that in the area between the tilt axle bearing (8) and the tilt mechanism (10), and inserted between the crankcase part (2) and the cylinder-receiving part (6), there are prestressing members (38), for example screw springs, which tension these two parts apart and act between, on the one hand, a collar part (40) rigidly connected to the crankcase part and, on the other hand, a collar part (44) rigidly connected to the cylinder-receiving part (6).

11. Internal combustion engine according to any of the preceding claims, characterized in that the prestressing members (38; 50) consist of a compression spring stack or hydraulic force generators.

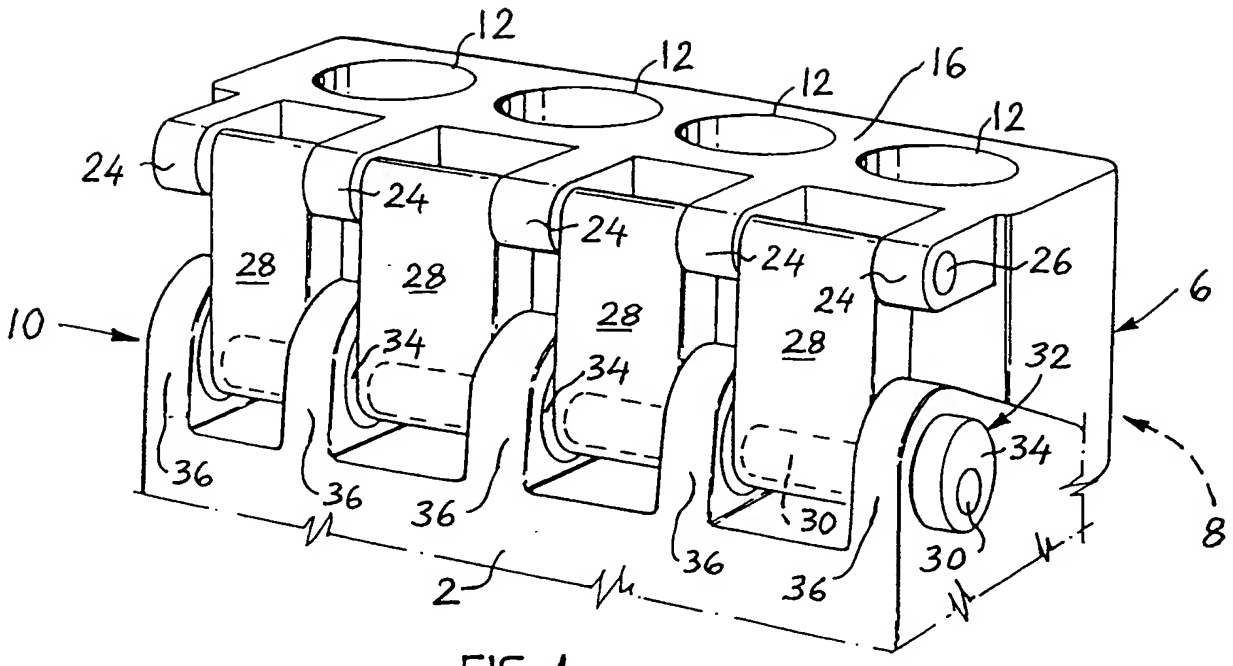
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FIG. 1

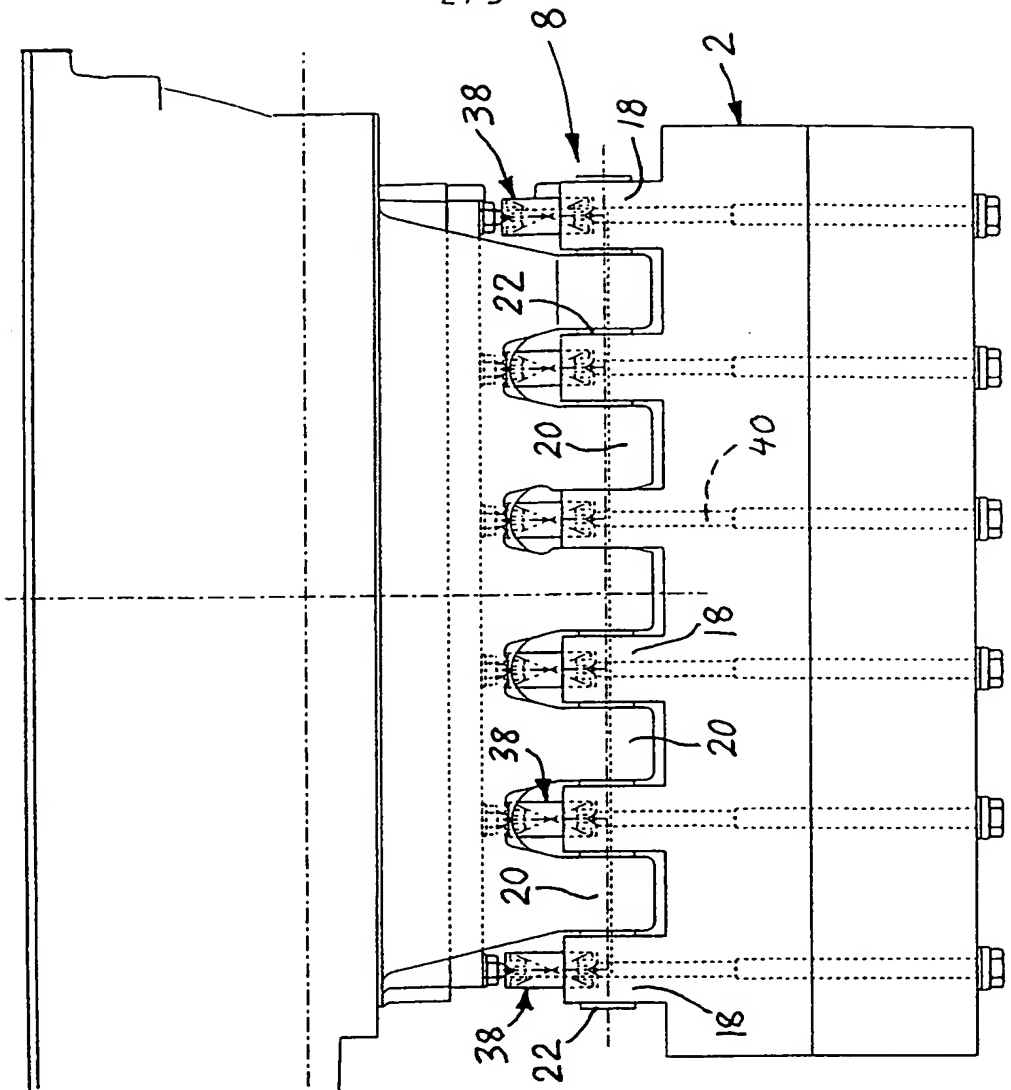
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FIG.2

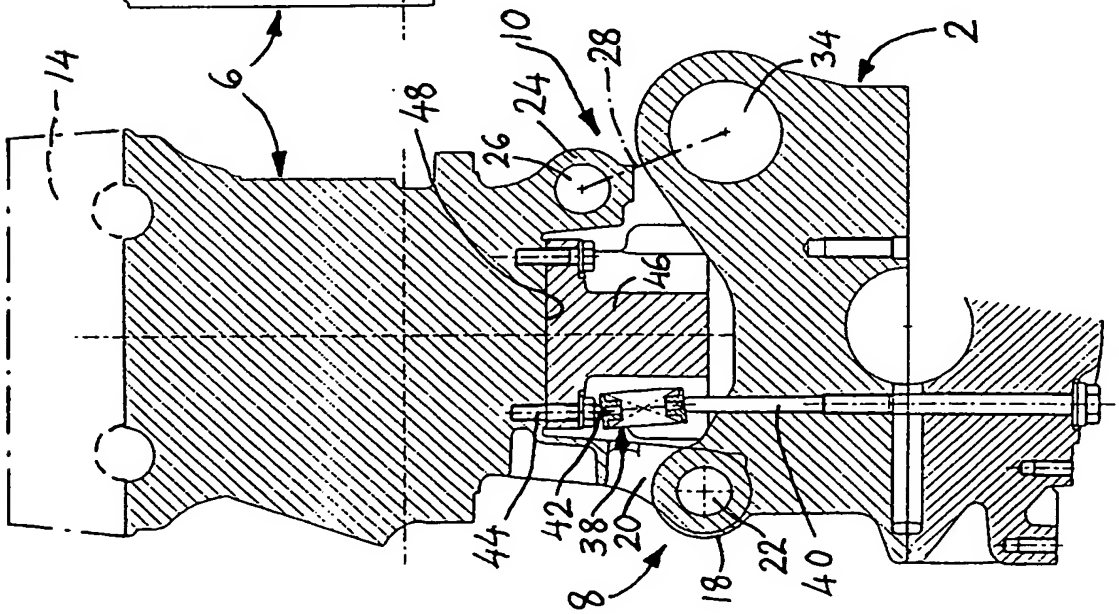
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FIG.3

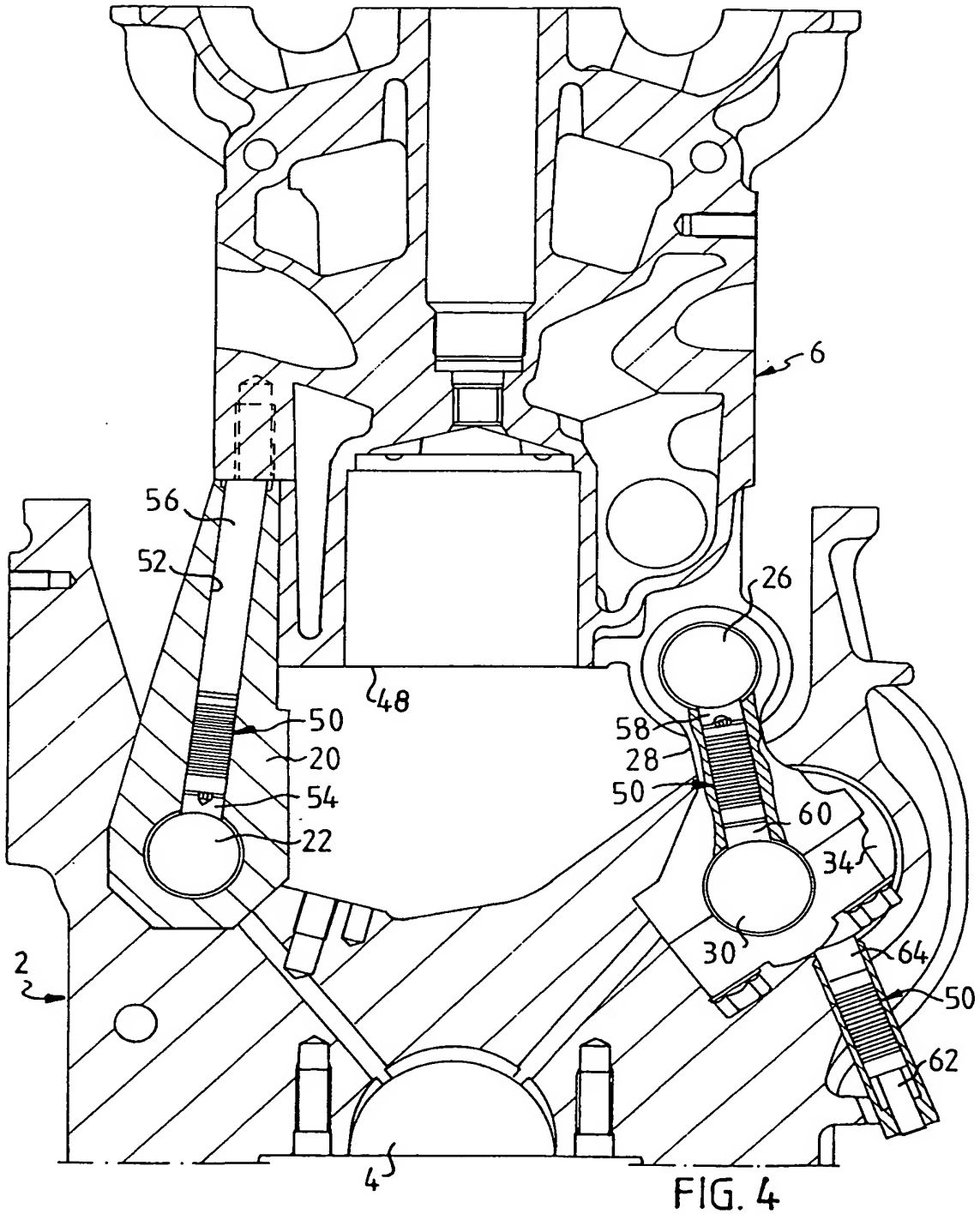

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00498

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F02B 75/04, F02D 15/04
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 2404231 A1 (ROSENBAU, VIKTOR), 31 July 1975 (31.07.75) --	1-11
A	DE 3542629 A1 (SCHMIDT, MARTIN), 4 June 1987 (04.06.87) --	1-11
A	SE 470238 B (SAAB AUTOMOBILE AB), 12 November 1993 (12.11.93) --	1-11
A	US 2770224 A (G.R. ERICSON), 13 November 1956 (13.11.56) --	1-11

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00498

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4174683 A (VIVIAN), 20 November 1979 (20.11.79)	1-11
	--	
A	US 5329893 A (DRANGEL ET AL), 19 July 1994 (19.07.94)	1-11
	--	
A	US 5443043 A (NILSSON ET AL), 22 August 1995 (22.08.95)	1-11
	--	
A	US 5562069 A (GILLBRANDET AL), 8 October 1996 (08.10.96)	1-11
	--	

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/SE 00/00498

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2404231 A1	31/07/75	NONE	
DE 3542629 A1	04/06/87	DE 3639850 A	26/05/88
SE 470238 B	12/11/93	DE 69310732 D,T	15/01/98
		EP 0640176 A,B	01/03/95
		JP 7506652 T	20/07/95
		SE 9201472 A	12/11/93
		US 5562069 A	08/10/96
		WO 9323664 A	25/11/93
US 2770224 A	13/11/56	NONE	
US 4174683 A	20/11/79	NONE	
US 5329893 A	19/07/94	DE 69107858 D,T	26/10/95
		DE 69114301 D,T	27/06/96
		EP 0560817 A,B	22/09/93
		EP 0560825 A,B	22/09/93
		JP 6504826 T	02/06/94
		JP 6504827 T	02/06/94
		SE 468223 B,C	23/11/92
		SE 9003835 A	04/06/92
		US 5443043 A	22/08/95
		WO 9209798 A	11/06/92
		WO 9209799 A	11/06/92
		SE 9100817 D	00/00/00
US 5443043 A	22/08/95	DE 69107858 D,T	26/10/95
		DE 69114301 D,T	27/06/96
		EP 0560817 A,B	22/09/93
		EP 0560825 A,B	22/09/93
		JP 6504826 T	02/06/94
		JP 6504827 T	02/06/94
		SE 468223 B,C	23/11/92
		SE 9003835 A	04/06/92
		US 5329893 A	19/07/94
		WO 9209798 A	11/06/92
		WO 9209799 A	11/06/92
		SE 9100818 D	00/00/00
US 5562069 A	08/10/96	DE 69310732 D,T	15/01/98
		EP 0640176 A,B	01/03/95
		JP 7506652 T	20/07/95
		SE 470238 B,C	13/12/93
		SE 9201472 A	12/11/93
		WO 9323664 A	25/11/93
		DE 9311765 U	04/11/93
		SE 9300399 A	21/04/93